

# Maternal Smoking: Determinants and Associated Morbidity in Two Areas in Lebanon

Rana Bachir · Monique Chaaya

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## Abstract

**Objectives** This study assessed the factors related to smoking during pregnancy in two areas in Lebanon, and the association of smoking to selected maternal and newborn health related factors.

**Methods** This was a secondary analysis of data on 538 women who delivered in nine hospitals in two areas in Lebanon. Women were interviewed about their smoking practices, and on demographic and psychosocial variables. 396 women were followed up and re-interviewed about their smoking status, and the mother's and baby's health after delivery. Smoking during pregnancy included both cigarettes and narghile smoking.

**Results** About 25.7% of women were smoking some kind of tobacco during pregnancy. Older women, Muslim women, women with poor education, those who had financial difficulty, nervousness, lower support, and delay in seeking prenatal care were more likely to smoke during pregnancy. Women who smoked during pregnancy were more likely to have a low birth weight baby and to stop breastfeeding.

**Conclusions** It is important to address smoking among women in general, and not only during pregnancy. We discuss the role of public and private sectors in smoking cessation and interventions.

**Keywords** Maternal smoking · Nargileh · Lebanon · Tobacco

## Introduction

According to the World Health Organization (WHO), 5 million deaths worldwide are attributed annually to tobacco products. Internationally, the prevalence of smoking is 29% with 47.5% among men and 10.3% among women [1]. Lebanon has one of the highest smoking rates in the Eastern Mediterranean region (EMR) countries, and the highest rate among women [2]. Of particular concern are pregnant women who smoke. Previous studies have evaluated smoking practices among pregnant women, and estimated the maternal smoking rate to be around one fourth [3, 4]. Smoking prevalence during pregnancy varies worldwide from as low as 8.0% among Jewish women [5] to as high as 31% in Australia [6]. Smoking in Lebanon and the region is on the rise with no serious effort from governments to address the issue. During the recent bout of violence (July 2006 Hizbullah-Israel war), among the few things that civilians took while leaving their homes were their narghiles (water pipes) and packs of cigarettes. During this war, a survey of internally displaced persons (IDPs) reported almost 50% of adult women smoking and half of them stating that they increased their smoking to cope with the war [Unpublished manuscript].

Smoking for both genders contributes greatly in developing life-threatening diseases and for women, it confers a higher risk of premature menopause and impaired fertility [7]. Of particular concern are the deleterious health effects of smoking during pregnancy such as spontaneous abortion, stillbirth, prematurity, low birth weight, sudden infant death syndrome, impaired physical and intellectual development, and decreasing breastfeeding prevalence [8, 9]. A recent article reported strong evidence of an association between maternal smoking and obesity among offspring [10].

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R. Bachir · M. Chaaya (✉)  
Department of Epidemiology and Population Health,  
Faculty of Health Sciences, American University of Beirut,  
Beirut, Lebanon  
e-mail: mchaaya@aub.edu.lb

Women who continue to smoke during pregnancy are more likely to suffer from psychological and emotional conditions, to have low self-confidence, to face financial and family problems, to have little social support, and to have low living stability [11, 12]. Moreover, women whose partners smoke, who initiate smoking at a younger age, who believe that smoking can facilitate their delivery or believe that smoking is less harmful to their babies, and those who have higher level of cigarette addiction prior to their pregnancy are more likely to smoke in pregnancy [13]. Among the socio-demographic factors related to maternal smoking are socio economic status, employment status of the mother, age and level of education, and race. A delay in seeking prenatal care is also associated with an increased likelihood of maternal smoking, in addition to inadequate diets and nutritional deficiencies during pregnancy [14, 15]. Other determinants reported in a review of nine cohort studies on smoking in pregnancy are parity and exposure to passive smoking [16]. A recent study in Lebanon among women who smoked during pregnancy reported that pregnant women who are more knowledgeable about the harmful effects of maternal smoking on the baby are more prone to stop or to decrease smoking [17].

The objectives of this study were twofold: (1) to examine the relationship of selected factors (demographic, psycho-social and antenatal care variables) to smoking during pregnancy among women delivering in hospitals in Lebanon, and (2) to assess the effect of maternal smoking on birth weight, and on breastfeeding status.

This study adds to the findings of earlier studies by including other determinants of maternal smoking, and allowing the prospective assessment of the relationship of smoking and outcomes in mothers and children.

## Methods

### Data Source

The study was a secondary analysis of data from a prospective investigation of postpartum depression among women delivering in hospitals situated in Beirut, the capital of Lebanon, and the Bekaa valley. In the first phase of the study, all women who delivered in nine selected hospitals in Beirut (between June and August 1998) and in Bekaa (between October and December 1997) were asked to consent verbally to a structured interview in the hospital. All women approached ( $n = 538$ ) agreed to participate, and all consented to be re-interviewed at home after 2–3 months. The baseline interview covered information on socio-demographic characteristics, women's health status and health care during pregnancy and immediately after delivery, specific life-events, social support, risky

behaviors during pregnancy and the newborn's health. Of the 538 women who were interviewed in the first phase, 396 were followed up. Women were lost to follow up in Beirut because addresses were not adequate to trace them, while in the Bekaa, it was difficult to reach women living in very remote areas. Women who participated in phase II had higher educational levels compared to those who did not. More details on the methodology are found elsewhere [18]. Women were re-interviewed in their homes (phase II). Questions addressed infants' health status, breastfeeding, infant's vaccination, complications related to delivery, and postpartum depression.

### Measures

Smoking during pregnancy, the main variable of interest, was defined as smoking cigarettes or the narghile during pregnancy and was determined among those who reported smoking prior to the index pregnancy. Questions were asked about the status of smoking before and during pregnancy including the onset of smoking (age at starting smoking the narghile and cigarettes), the type of smoking (narghile, cigarettes or both) and the smoking intensity (number of cigarettes per day and narghile per week). The number of cigarettes per day was divided into three categories: mild (1–9), moderate (10–20) and heavy (20+). Women who stopped smoking during pregnancy were also asked whether they resumed smoking after they delivered.

The determinants of maternal smoking selected for the study were:

1. Socio demographic variables: age (20 years/21–29 years/30–34 years and  $\geq 35$  years), education (Elementary/intermediate/secondary/university), parity (primiparous/multiparous), working status (worked during pregnancy/stopped working during pregnancy/did not work) and religion (Christian/Muslim).
2. Psychosocial variables included the occurrence of life events, availability of social support, planned pregnancy (yes/no), and nervousness (yes/no). The occurrence of the following life events during pregnancy were included in the analysis: abortion, death, sickness, personal problems, and financial problems. Initially, the questionnaire addressed 18 life events. These were grouped into five main events to improve the statistical power and to simplify the analysis. All the events were presented as (Yes, occurred/No, did not occur) and these were: Abortion; death (death in the household, death of a relative and death of a friend); sickness included sickness of a family member and a friend; personal problems were those related to work and other similarly important problems occurring to the family and friends; financial problems pooled

change in financial status and deficiency in money for basic needs. The availability of social support was measured as the number of persons providing close support: (0 to one person and more than one).

3. Antenatal care: Questions on antenatal care covered the trimester of the first antenatal visit (1st/2nd and 3rd), the number of visits ( $1-3/\geq 4$ ), and compliance with recommended diets (yes/no) and with vitamins/minerals (yes/no) intake during pregnancy.

In addition, this study examined the effect of smoking during pregnancy on the health of the mothers and selected outcomes related to the babies. Specifically, the former was assessed by identifying whether the pregnant women developed any chronic diseases during their pregnancy (hypertension, renal failure, anemia, gastrointestinal problems, back pain, and migraine). Two outcomes were chosen to study the effect of smoking on the baby and these were birth weight and breastfeeding status. The birth weight was classified as less or equal to 2500 g, categorized as having low birth weight, and greater than 2500 g (normal weight). Breastfeeding comprised four groups: exclusive breastfeeding, bottle feeding and breastfeeding, only bottle feeding, and stopped breastfeeding. Information on reasons for not breastfeeding included mother's health, insufficiency of milk, nipple problem, perceived sufficiency of breastfeeding duration and other reasons.

#### Data Analysis

Statistical analyses were performed using SPSS.14 (Statistical Package for Social Sciences) and STATA.7. In the univariate analysis, the socio-demographic characteristics and smoking characteristics were examined by area (Beirut vs. the Bekaa). In the bivariate analysis, Student's *t*-test and Pearson's  $\chi^2$  test were used to assess the significance of the statistical association between the independent variables (continuous and categorical) and smoking during pregnancy, the dependent variable. Both tests were interpreted at a predetermined significance level ( $\alpha = 0.05$ ). Furthermore, the magnitude of association between the predictor variables and smoking during pregnancy was determined through calculating the odds ratios (OR) and their corresponding 95% confidence intervals (CI). We tested for possible interactions between social support and several variables including personal problems and financial problems. Only the interaction with parity was significant. To find the best model that fits the data and that explains the association between smoking during pregnancy and all independent variables, a multivariate analysis was performed using logistic regression. A backward selection procedure, with significance level for removal from the model set at 0.2, was conducted. We started by fitting

smoking during pregnancy with all independent variables found to be significant at the bivariate level: age, education, personal problem, financial problem, social support, religion, and nervousness. The estimated coefficients of the best-fitted model were computed, along with their ORs and 95% CIs. Further, in order to determine the final best model at discriminating between the categories of the outcome variable (smoking during pregnancy: Yes/No), we used the ROC (receiver operating characteristic) curve. Cook's distance statistic was used to check for influential observations that might have large effects on the estimated parameters.

## Results

### Profile of the Sample

The socio-demographic characteristics of the study sample are presented in Table 1. Overall, 538 women were surveyed. Of these, 303 were living in Beirut and 235 in the Bekaa area. The mean age of the women was  $28.18 \pm 5.87$  years, with the highest proportion in both areas in the 21–29 years age group (48.9%). The socio-demographic characteristics of these two groups were different. Compared with women residing in Beirut, the Bekaa women had lower educational level (8.1% university level in Bekaa vs. 28.7% in Beirut), were more likely to be unemployed (89.7% vs. 64.4%) and to be multiparous (74.9% vs. 66.0%). The overwhelming majority were Muslim (81.0%), with 97.4% of them living in the Bekaa valley. On average, the monthly income was higher in Beirut than in Bekaa (600 S\$ vs. 400 US\$).

With regard to psychosocial factors, 54.6% of the women reported having more than one close person for support during pregnancy. The most commonly reported group of life events was personal problems (28.0%), followed by sickness (25.5%), death (21.5%) and then abortion (13.1%). A little more than half reported that the index pregnancy was not planned (55.1%). One third reported suffering from nervousness during pregnancy.

A majority of women made their first antenatal visit in the first trimester of their pregnancy (87.4%), with 85.5% of them visiting more than four times. Almost all women in both areas took the recommended vitamins (96.1%). The majority of women in the sample complied with the dietary recommendations (86.4%).

### Smoking Characteristics

Table 2 shows the distribution of the sample of women according to selected smoking practices. In both Beirut and the Bekaa, close to one third of women reported ever

**Table 1** Distribution of women by selected socio-demographic, psychosocial and antenatal care variables in two areas, Beirut and Bekaa

Variables	Beirut		Bekaa		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
<i>Socio-demographic characteristics</i>						
Age*						
≤20	19	6.3	31	13.2	50	9.3
21–29	148	48.8	115	48.9	263	48.9
30–34	82	27.1	60	25.5	142	26.4
35+	54	17.8	29	12.3	83	15.4
Education***						
Elementary	49	16.2	81	34.5	130	24.2
Intermediate	77	25.4	94	40	171	31.8
Secondary	90	29.7	41	17.4	131	24.3
University	87	28.7	19	8.1	106	19.7
Religion***						
Christian	96	31.7	6	2.6	102	19
Muslim	207	68.3	229	97.4	436	81
Work status***						
Yes, work during pregnancy	84	27.7	14	6	98	18.3
Stop working during pregnancy	24	7.9	10	4.3	34	6.4
No	195	64.4	208	89.7	403	75.3
Parity*						
Primiparous	103	34	59	25.1	162	30.1
Multiparous	200	66	176	74.9	376	69.9
Monthly income per 1000 L.L.***						
25%	600		450		500	
50%	900		600		700	
75%	1737		837		1200	
<i>Psychosocial factors</i>						
Social support (nb of close support)						
0 to one person	129	42.6	115	48.9	244	45.4
More than one	174	57.4	120	51.1	294	54.6
Abortion						
No	256	84.5	210	90.1	466	86.9
Yes	47	15.5	23	9.9	70	13.1
Death*						
No	249	82.5	167	73.2	416	78.5
Yes	53	17.5	61	26.8	114	21.5
Sickness						
No	216	71.8	181	78	397	74.5
Yes	85	28.2	51	22	136	25.5
Personal problems						
No	212	70.7	168	73.7	380	72
Yes	88	29.3	60	26.3	148	28
Financial problems						
No	237	78.2	167	73.6	404	76.2
Yes	66	21.8	60	26.4	126	23.8
Planned pregnancy**						
No	120	39.6	121	51.7	241	55.1
Yes	183	60.4	113	48.3	296	44.9

**Table 1** continued

Variables	Beirut		Bekaa		Total	
	N	%	N	%	N	%
Nervousness***						
No	165	54.5	195	83	360	66.9
Yes	138	45.5	40	17	178	33.1
Antenatal care						
Trimester of first visit						
1st	267	88.7	176	85.4	443	87.4
2nd and 3rd	34	11.3	30	14.6	64	12.6
Number of visits***						
1–3	6	2	68	32.5	74	14.5
≥4	296	98	141	67.5	437	85.5
Diet compliance**						
No	7	7.7	15	21.1	22	13.6
Yes	84	92.3	56	78.9	140	86.4
Vitamins/minerals compliance						
No	11	3.9	7	3.8	18	3.9
Yes	272	96.1	175	96.2	447	96.1

\*  $P$ -value < 0.05; \*\*  $P$ -value < 0.01; \*\*\*  $P$ -value < 0.001

smoking cigarettes (31.0% vs. 28.5%), whereas fewer women reported ever smoking narghile (16.5% vs. 6%). Women residing in Beirut were found to be twice as heavy smokers as those residing in the Bekaa. During pregnancy, around a quarter (25.7%) of women were smoking some kind of tobacco, 21.8% were smoking cigarettes and 6.1% were smoking the narghile. Among those who smoked prior to pregnancy, 69% continued to smoke throughout pregnancy (138 out of 201 ever smokers). The majority of women who smoked during pregnancy were moderate smokers. The mean age at starting smoking cigarettes and the narghile was  $18.75 \pm 4.35$  and  $24.30 \pm 4.13$  years respectively. Among those who stopped smoking during pregnancy, 11.1% resumed smoking after delivery.

#### Determinants of Smoking During Pregnancy: Multivariate Analyses

All selected determinants showed a significant association with smoking during pregnancy at the bivariate level. Adjusted results presented in Table 3, showed that older age, being Muslim, reporting financial problems, nervousness, and antenatal care visits beginning in the second or third trimester of pregnancy were significant predictors associated with increased odds of smoking during pregnancy. Women with any university education and having more than one person as a close support decreased the odds of smoking during pregnancy. The odds of smoking during pregnancy among women aged 35 years and above was 4 times the odds of those aged less than 20 years (CI: 1.34,

12.33). The odds of smoking for women having university education was 0.43 times that of those having elementary level education (CI: 0.21, 0.89). Being Muslim was a risk factor for smoking during pregnancy, with odds of 2.75 compared with Christian women (CI: 1.32, 5.70). Women who reported financial problems were 1.79 times more likely to smoke during pregnancy (CI: 1.08, 2.99) than those who did not report. Women who had more than one person to support them socially were 0.35 times less likely to smoke than those who did not have close support (CI: 0.14, 0.88). A significant interaction was found between parity and number of close supports (OR = 3.31, CI: 1.15, 9.53). Furthermore, the goodness of fit test and ROC curve indicated that the final model was good enough at discriminating between the two categories of the outcome variable “smoking during pregnancy”. By using Cook’s distance, no influential observations were found to affect the estimated parameters.

#### Relationship of Smoking During Pregnancy and Selected Mother’s and Child’s Outcomes

Tables 4 and 5 presents the association between smoking during pregnancy and several specific outcomes including the mother’s chronic conditions during pregnancy, birth weight, the newborn’s nutritional status, reason for stopping breastfeeding and the duration of breastfeeding. Only gastrointestinal problems and migraine were significantly associated with smoking during pregnancy. Women who smoked during pregnancy were 1.65 and 4.42 times likely

**Table 2** Distribution of women by selected smoking practices in two areas Beirut and Bekaa

Variables	Beirut		Bekaa		Total	
	N	%	N	%	N	%
<i>Smoking during lifespan</i>						
Ever smoked cigarettes						
No	209	69	168	71.5	377	70.1
Yes	94	31	67	28.5	161	29.9
Ever smoked narghile						
No	253	83.5	220	94	473	88.1
Yes	50	16.5	14	6	64	11.9
Cigarettes per day						
Mild	37	39.4	25	41	62	40
Moderate	41	43.6	31	50.8	72	46.5
Heavy	16	17	5	8.2	21	13.5
Mean age at starting smoking cigarettes (N = 158)					18.75 ± 4.35	
Mean age at starting smoking narghile (N = 63)					24.30 ± 4.13	
Mean age narghile per week (N = 61)					1.88 ± 2.51	
<i>Smoking during pregnancy</i>						
Smoking during pregnancy (any tobacco)						
No	222	73.3	176	75.5	398	74.3
Yes	81	26.7	57	24.5	138	25.7
Smoking cigarette during pregnancy						
No	238	78.5	182	77.8	420	78.2
Yes	65	21.5	52	22.2	117	21.8
Smoking narghile during pregnancy						
No	278	91.7	226	96.6	504	93.9
Yes	25	8.3	8	3.4	33	6.1

to have gastrointestinal problems and migraine respectively than those who did not smoke. Smoking during pregnancy was not associated with other chronic health problems that developed during pregnancy such as hypertension, renal failure, anemia, and back pain.

Women who were smoking during pregnancy were significantly more likely to have low birth weight babies as compared to women who did not smoke (13.0% vs. 6.5%,  $P = 0.020$  OR = 2.15). A substantial proportion of women who were smoking during pregnancy breastfed, then stopped (42.4% vs. 24.9%,  $P = 0.008$ ). The majority of women who were smoking during pregnancy reported stopping breastfeeding because of the deficiency in their milk (71.8% vs. 42.2%,  $P = 0.024$  OR = 2.77). Babies aged between 3 and 4 months whose mothers were smoking during pregnancy experienced half the duration of breastfeeding of those mothers who did not smoke in pregnancy ( $P = 0.030$ ).

**Table 3** Multiple logistic regression analysis of smoking during pregnancy with: best model (Adjusted Odds Ratios OR , 95% CI, and P value)

Variables	OR	95% CI	P-value
Age (≤20)			
21–29	2.09	0.80, 5.48	0.133
30–34	3.17	1.12, 8.95	0.029
35+	4.07	1.34, 12.33	0.013
Education (Elementary)			
Intermediate	0.72	0.40, 1.28	0.262
Secondary	0.49	0.25, 0.95	0.036
University	0.43	0.21, 0.89	0.024
Religion (Christian)			
Muslim	2.75	1.32, 5.70	0.007
Personal problem (No)			
Yes	1.39	0.84, 2.30	0.199
Financial problem (No)			
Yes	1.79	1.08, 2.99	0.025
Nervousness (No)			
Yes	1.56	0.98, 2.48	0.058
Social support (nb of close support) (0 to one person)			
More than one	0.35	0.14, 0.88	0.026
Trimester of first visit (1st)			
2nd and 3rd	1.78	0.96, 3.23	0.065
Parity* Social support	3.31	1.15, 9.53	0.026

\* indicates an interaction between two variables  
in brackets are the reference categories

## Discussion

This study reports on the determinants of smoking during pregnancy along with its associated morbidity. Unlike other studies, smoking in pregnancy is defined as smoking cigarettes or the narghile during pregnancy. It is true that the prevalence rates of narghile smoking are not high, but there is an increasing trend of use in this part of the world, and specifically among women, despite the evidence of its harmful effects. Studies on the effect of narghile on smoking during pregnancy are scarce. However, recent studies have documented the presence of large amounts of tar and heavy metals (i.e. arsenic, chromium, and lead) in the narghile, together with high levels of nicotine [19]. The study showed again that smoking in pregnancy is a public health issue of significant magnitude. More than one fourth of the mothers were smoking either cigarettes or the narghile during pregnancy. This prevalence rate is nearly two times greater than that reported in the United States (12% in 2000) [20], but approximately comparable to that in Australia (31% in 1996) [6]. Findings indicate that older age, poor education, being Muslim and the presence of financial problems, nervousness, lower support, and delay



**Table 4** Distribution of women by specific health outcomes and smoking in pregnancy

Variables	Smoking during pregnancy (+) <i>N</i> (%)	Smoking during pregnancy (–) <i>N</i> (%)	<i>P</i> -value
<i>Chronic health problems</i>			
Hypertension			
No	130 (95.6%)	364 (92.6%)	0.317
Yes, only during pregnancy	6 (4.4%)	29 (7.4%)	
Renal failure			
No	117 (92.1%)	370 (96.4%)	0.086
Yes, only during pregnancy	10 (7.9%)	14 (3.6%)	
Anemia			
No	90 (73.8%)	244 (68.2%)	0.257
Yes, only during pregnancy	32 (26.2%)	114 (31.8%)	
Gastrointestinal problems			
No	76 (65.5%)	274 (75.9%)	0.03
Yes, only during pregnancy	40 (34.5%)	87 (24.1%)	
Back pain			
No	68 (58.6%)	237 (64.8%)	0.269
Yes, only during pregnancy	48 (41.4%)	129 (35.2%)	
Migraine			
No	114 (90.5%)	378 (97.7%)	0.001
Yes, only during pregnancy	12 (9.5%)	9 (2.3%)	
Baby's outcomes			
Birth weight			
<2500	18 (13.0%)	26 (6.5%)	0.02
>2500	120 (87.0%)	372 (93.5%)	
Breastfeeding			
Exclusive breastfeeding	31 (31.3%)	101 (35.4%)	0.008
Bottle feeding and breastfeeding	16 (16.2%)	75 (26.3%)	
Only bottle feeding	10 (10.1%)	38 (13.3%)	
Breastfed and stopped	42 (42.4%)	71 (24.9%)	
Stop breastfeeding			
Mother's health	1 (2.6%)	6 (9.4%)	0.024
Not enough milk	28 (71.8%)	27 (42.2%)	
Problems in nipple	1 (2.6%)	5 (7.8%)	
This period is enough	6 (15.4%)	9 (14.1%)	
Others	3 (7.7%)	17 (26.6%)	
Duration of breastfeeding			
2 months	28 (65.1%)	34 (46.6%)	0.03
3–4 months	9 (20.9%)	33 (45.2%)	
>4 months	6 (14.0%)	6 (8.2%)	

in seeking prenatal care were associated with smoking during pregnancy. These results are consistent with previous studies [11, 12, 14].

This study adds to prior research in examining the effect of religion on smoking during pregnancy and hence shedding some lights on the crucial role religious organizations or individuals can play, in shaping people's behavior towards smoking. Although Islam prohibits the use of anything that is harmful to the human's well being, a high proportion Muslim men and women are smokers. Hence,

religious leaders can play a role in educating people directly or indirectly about the deleterious effect of smoking and how it relates to the Islam through religious teachings and seminars, targeting specifically tobacco use. This issue deserves more qualitative research and one should be careful in making conclusions about Muslim women and differentiate between religiosity and religion.

Reporting financial problems is a major predictor of smoking during pregnancy. Sliaphpush and Carlin [21] reported that financial stress was associated with decreased

**Table 5** Unadjusted odds ratio and confidence intervals for specific health outcomes

Variables	OR	CI
Birth weight (>2500)		
<2500	2.15	1.14, 4.05
Breastfeeding (Other)		
Exclusive breastfeeding	0.96	0.58, 1.58
Stop breastfeeding (Other)		
Not enough milk	2.77	1.25, 6.13

smoking cessation among smokers and with increased smoking relapse among ex-smokers. In fact, smoking tends to be more common among poor people than among rich ones. Nevertheless, this does not imply a causal association between smoking and poverty. Several explanations can illustrate the above-mentioned association. First, poor and less educated people may be unaware of the deleterious effects of smoking, especially on the babies' health, and therefore they are more likely to continue to smoke in pregnancy. There is a saying in Lebanon, common among low educated women that the fetus is "in a bag" and protected from any harm. Second, some people believe that smoking plays a major role in relieving stress, in regulating mood and in dealing with the strains due to limited financial resources. However, there is no conclusive evidence about the sedative or anxiolytic effect of tobacco, particularly nicotine. While in animal studies findings showed that nicotine does have an anxiolytic effect [22], epidemiological observational studies on human have reported the contrary. The latter line of research emphasizes that smoking increases stress [23]. Third, some consider that smoking is the least thing a poor individual can do for himself or herself to compensate for his/her miserable financial status [24]. The relationship of nervousness during pregnancy and smoking relate to the earlier discussion on stress and smoking and to findings in similar studies [25]. It is also reported in an earlier study in Lebanon that pregnant women do not try to quit because they worry about the withdrawal symptoms and specifically the psychological distress [18].

Women with less social support were found to be more prone to smoke during pregnancy. This emphasizes the importance of integrating social support in programs addressing smoking cessation during pregnancy. The data also showed that primiparous women are more likely to quit smoking when they have good social support. Emotional support, mainly from friends and family, constituted an incentive to modify smokers' behaviors towards cessation [26, 27]. The delay in seeking prenatal care that was found to be associated with smoking during pregnancy indicates the importance of early antenatal consultation to identify smokers and work out a plan for quitting.

Looking at smoking associated morbidity, the bivariate results of this study showed that low birth weight was found to be significantly twice as common among women who continue to smoke during pregnancy than among non-smoking women. This finding was consistent with a previous study conducted among Lebanese pregnant women who were smoking narghile [28].

In line with previous research, this study provides evidence of the effect of smoking on breastfeeding. Liu et al. [29] stated that in order to increase the breastfeeding duration, mothers should not smoke during pregnancy and should not be heavier smokers in the postnatal period. They found that compared to non-smokers, early weaning (not breastfeeding at 10 weeks) was significantly associated with persistent smoking. However, the duration of breastfeeding among quitters and postpartum relapsers did not differ greatly from that of non-smokers. They also reported that women smoking more than 10 cigarettes per day in the postpartum period were almost twice as likely to stop breastfeeding as compared to non-smokers. Breastfeeding has an impact on the overall health of the baby and the mother [30]. Its wide array of benefits (nutritional, immunological, emotional and psychological) should be enough for mothers to stop smoking and breastfeed their children for longer durations; health care workers should use this information as an incentive to help mothers quit.

One limitation of this study is its lack of assessment of the association between partner's smoking status and maternal smoking. In addition, determining if a woman was smoking during pregnancy was based on simple self-reported questions asking her whether she smoked and the level of addiction without an objective measure. Hence, the problem of underreporting cannot be disregarded. The first two limitations are related to the fact that the initial study was not conducted to investigate smoking determinants and consequences. In examining the effect of smoking on baby's health status, variables such as stillbirth, prematurity, and sudden infant death syndrome could not be assessed, because of their rare occurrences, thus affecting the power of the study. The study is cross-sectional and thus temporal relationships cannot be established and reverse causality cannot be ruled out.

## Conclusion and Recommendations

The present study revealed that smoking during pregnancy remains a major public health challenge. The high smoking prevalence among Lebanese pregnant women points to the urgent need for the health care system to address properly the issue of smoking. Pregnancy no doubt provides a golden opportunity to intercept smoking. However, one should not only wait for women to become pregnant, but



address the issue earlier before conception, for all women in the reproductive age groups. As stated earlier, smoking among women in general is high in Lebanon and it is on the rise in neighboring countries as cigarette smoking and smoking the narghile are becoming more socially acceptable.

Both public and private health sectors play a role in the control of smoking. The role of the public sector, represented mainly by the Ministry of Public Health (MOPH), is in the area of setting public policies, and setting a national comprehensive strategy to reduce smoking. Lebanon as many countries, has ratified the Framework Convention on Tobacco Control (FCTC) but did not put in place policies related to tobacco pricing, banning, advertising restrictions, education and provision of services for smoking cessation. The political will is present but the political action is missing. However, international agencies working closely with government bodies can play a major role. WHO supported the Ministry of Public Health in establishing a National Tobacco Office in the year 2000, but it is not currently active. Re-activating such a program or office could have a great impact on pushing forward public policy related to tobacco use. Public policies can reach all men and women. In addition, targeting women in the reproductive age groups could also be achieved through specific programs implemented by the MOPH and Ministry of Social affairs in the 167 primary care centers located in all areas in Lebanon and that incorporate Reproductive Health programs.

On the other hand, the private sectors, such as the obstetricians/gynecologists, public health workers, researchers, health promotion workers, and non governmental organizations (NGOs) working with women could develop and test interventions for smoking prevention and cessation.

The type of smoking cessation interventions tested for pregnant women include: the provision of information on the risks of smoking to the fetus and infant and the benefits of quitting; recommendations to quit; feedback about the fetus; and, teaching cognitive-behavioral strategies for quitting smoking. Pooled data from all the trials showed a significant reduction in smoking in the intervention groups with an absolute difference of 6.6% women continuing to smoke. Cognitive-behavioral strategies for smoking cessation were recommended for future trials since they provide a higher quit rate. The absence of process evaluation from most of the trials included was reported as a limitation of these trials [31].

An effective and practical intervention for smoking cessation should include special programs offering potent and informative counseling for smokers. However, hurdles to stop smoking must adequately be addressed. Usher et al. [32] examined the perceived barriers to and benefits of

attending a stop smoking course during pregnancy. They pointed out that the disappointed feeling of not succeeding in quitting and the lack of desire to ask for support to quit smoking were the most reported perceived barriers. The most reported advantages were evaluation and encouragement with smoking cessation and counseling for cigarette cravings. Finally, it is worthwhile if we can review and implement in the region the recommendations of the French Health Products Safety Agency. These consider that clinicians should recognize the smoking status of every patient and provide information related to the health consequences of smoking along with the available effective treatments. The obstetrician/gynecologist or other women's health care provider would be one of the most suited to do this [33]. When the counseling treatment (social support and behavioral and cognitive therapy) is ineffective, nicotine replacement therapy (NRT) should be prescribed. Although the NRT efficacy among pregnant women has not been totally confirmed [34], its use to support smoking cessation during that period "is justifiable in relation to the risk of continued smoking" [35].

Future research is needed to experiment with more customized interventions taking into consideration the local context of the women and the predictors discussed earlier and that determine smoking in pregnancy.

## References

1. World Health Organization. (2006). First conference of the parties to the WHO framework convention on tobacco control, tobacco free initiative.
2. Baddoura, R., & Wehbeh-Chidiac, C. (2001). Prevalence of tobacco use among the adult Lebanese population. *Eastern Mediterranean Health Journal*, 7(4/5), 819–828.
3. Chaaya, M., Jabbour, S., El-Roueiheb, Z., & Chemaitelly, H. (2004). Knowledge, attitudes, and practices of narghile (water pipe or hubble-bubble) and cigarette smoking among pregnant women in Lebanon. *Addictive Behaviors*, 29, 1821–1831.
4. United Nations Children's Fund. (2000). National Perinatal Survey, Lebanon 1999–2000. *UNICEF and Ministry of Public Health*.
5. Fisher, N., Yona, A., Haringman, M., Meiraz, H., Baram, N., & Leventhal, A. (2005). The prevalence of smoking among pregnant and postpartum women in Israel: A national survey and review. *Health Policy*, 71, 1–9.
6. Phung, H. N., Bauman, A. E., Young, L., Tran, M. H., & Hillman, K. M. (2003). Ecological and individual predictors of maternal smoking behaviour looking beyond individual socioeconomic predictors at the community setting. *Addictive Behaviors*, 28, 1333–1342.
7. Seltzer, V. (2003). Smoking as a risk factor in the health of women. *International Journal of Gynecology and Obstetrics*, 82, 393–397.
8. Fagerstrom, K. (2002). The epidemiology of smoking. Health consequences and benefits of cessation. *Drugs*, 62(Suppl.2), 1–9.
9. Najdawi, F., & Faouri, M. (1999). Maternal smoking and breastfeeding. *Eastern Mediterranean Health Journal*, 5(3), 450–456.

10. Mamun, A. A., Lawlor, D. A., Alati, R., O'Callaghan, M., Williams, G. M., & Najman, J. M. (2006). Does maternal smoking during pregnancy have a direct effect on future offspring obesity? Evidence from a prospective birth cohort study. *American Journal of Epidemiology*, 164(4), 317–25.
11. Diclemente, C. C., Dolan-Mullen, P., & Windsor, R. A. (2000). The process of pregnancy smoking cessation: Implications for interventions. *Tobacco Control*, 9(Suppl III), iii16–iii21.
12. Morasco, B. J., Dornelas, E. A., Fischer, E. H., Oncken, C., & Lando, H. A. (2006). Spontaneous smoking cessation during pregnancy among ethnic minority women: A preliminary investigation. *Addictive Behaviors*, 31, 203–210.
13. Bennett, P., & Clatworthy, J. (1999). Smoking cessation during pregnancy: testing a psycho-biological model. *Psychology, Health & Medicine*, 4(3), 319–326.
14. Zimmer, M. H., & Zimmer, M. (1998). Socioeconomic determinants of smoking behavior during pregnancy. *The Social Science Journal*, 35(1), 133–142.
15. Christian, P., West, K. P. Jr., Katz, J., Kimbrough-Pradhan, E., LeClerq, S. C., Khatry, S. K., & Shrestha, S. R. (2004). Cigarette smoking during pregnancy in rural Nepal. Risk factors and effects of  $\beta$ -carotene and vitamin A supplementation. *European Journal of Clinical Nutrition*, 58, 204–211.
16. Lu, Y., Tong, S., & Oldenburg, B. (2001). Determinants of smoking and cessation during and after pregnancy. *Health Promotion International*, 16(4), 355–365.
17. Barbour, B., Salameh, P., & Ziadeh, F. (2006). Tabagisme chez les mères libanaises: Connaissances, attitudes et pratiques. *Eastern Mediterranean Health Journal*, 12(3/4), 405–416.
18. Chaaya, M., Campbell, O. M. R., El Kak, F., Shaar, D., Harb, H., & Kaddour, A. (2002). Postpartum depression: Prevalence and determinants in Lebanon. *Archives of Women's Health*, 5, 65–72.
19. Shihadeh, A. (2003). Investigation of mainstream smoke aerosol of the argileh water pipe. *Food and Chemical Toxicology*, 41, 143–152.
20. Cnattingius, S. (2004). The epidemiology of smoking during pregnancy: smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research*, 2(6), S125–S140.
21. Siahpush, M., & Carlin, J. B. (2005). Financial stress, smoking cessation and relapse: Results from a prospective study of an Australian national sample. *Addiction*, 101, 121–127.
22. Levin, E. D., Bencan, Z., & Cerutti, D. T. (2007). Anxiolytic effects of nicotine in Zebrafish. *Physiology and Behavior*, 90, 54–58.
23. Parrot, A. C. (1999). Does cigarette smoking cause stress. *American Psychologist*, 54(10), 817–820.
24. Bobak, M., Jha, P., Nguyen, S., & Jarvis M. (2000). Poverty and smoking. In P. Jha & FJ. Chaloupka (Eds.), *Tobacco control in developing countries* (pp. 41–61). Oxford: Oxford University.
25. Bullock, L. F. C., Mears, J. L. C., Woodcock, C., & Record, R. (2001). Retrospective study of the association of stress and smoking during pregnancy in rural women. *Addictive Behaviors*, 26, 405–413.
26. Hanson, B. S., Isacson, S. O., & Janson, L. (1990). Social support and quitting smoking for good. Is there an association? Results from the population study, “men born in 1914”, Malmö, Sweden. *Addictive Behaviors*, 15(3), 221–233.
27. Wagner, J., Burg, M., & Sirois, B. (2004). Social support and the transtheoretical model: Relationship of social support to smoking cessation stage, decisional balance, process use, and temptation. *Addictive Behaviors*, 29, 1039–1043.
28. Nuwayhid, I. A., Yamout, B., Azar, G., & Kambris, M. A. (1998). Narghile (Hubble-Bubble) smoking, low birth weight, and other pregnancy outcomes. *American Journal of Epidemiology*, 148(4), 375–383.
29. Liu, J., Rosenberg, K. D., & Sandoval, A. P. (2006). Breast-feeding duration and perinatal cigarette smoking in a population-based cohort. *American Journal of Public Health*, 96(2), 309–314.
30. León-Cava, N., Lutter, C., Ross, J., & Martin, L. (2002). *Quantifying the benefits of breastfeeding: A summary of the evidence*. Washington, D.C.: PAHO.
31. Lumley, J., Oliver, S. S., Chamberlain, C., & Oakley, L. (2004). Interventions for promoting smoking cessation during pregnancy (Review). *Cochrane Database of Systematic Reviews*, CD001055 (4), 1–70.
32. Ussher, M., Etter, J. F., & West, R. (2006). Perceived barriers to and benefits of attending a stop smoking course during pregnancy. *Patient Education and Counseling*, 61(3), 467–472.
33. Le Foll B., Melihan-Cheinin P., Rostoker G., & Lagrue G. (2005). Smoking cessation guidelines: Evidence-based recommendations of the French Health Product Safety Agency. *European Psychiatry*, 20, 431–441.
34. Coleman, T., Britton, J., & Thornton, J. (2004). Nicotine replacement therapy in pregnancy. *British Medical Journal*, 328, 965–966.
35. Molyneux, A. (2004). ABC of smoking cessation: Nicotine replacement therapy. *British Medical Journal*, 328, 454–456.

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